THE BUTTERFLIES OF STARA PLANINA (SERBIA) WITH EMPHASIS ON *M. JURTINA* LINNAEUS

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A total of 243 species of butterfly are to be found on the territory of the former Yugoslavia (Jaksic, 1988). Early in my stay in Yugoslavia I met Predrag Jaksic, and he laughingly said 'In Britain you only have 66 species. I can take you to Stara Planina and you will catch that many in one day!' In July 1992 I was able to take him up on the offer, and I was not disappointed.

Stara Planina means literally the old mountain, and is the name of a massif running across Bulgaria and into south Serbia, with the summit of Midzor at 2169 m, close to the border. The whole flora and fauna of the area is rich (Misic *et al.*, 1978; Mesaros *et al.*, 1984), as it includes an important relict area focused on the village and valley of Topli Do (lit. warm valley). Here a delightful abundance of butterflies is to be found in a remote and unspoiled setting.

What follows includes an account of the species we took together that weekend, but is really the result of a much wider exploration by Jaksic during the month of July in 1991 and 1992, when he visited localities that span a broader range of biotopes than the deciduous foothill and montane woodlands of Topli Do. It incorporates observations on the population of *M. jurtina* L. in that isolated locality.

BIOMES AND LOCALITIES

All the collecting localities fell within 3 adjacent UTM grid squares, but the area embraced 3 separate biomes between 550 and 1750 m: (a) submediterranean oak woodlands (oak); (b) southern European; mostly deciduous foothill and montane woodlands (S. Eur.), and (c) rocky ground; pasture and woodland on Mediterranean mountains (rocky).

Ten localities were investigated, as shown in Table 1.

Table 1. Details of localities 1–10.

Serial	Biome	Locality	Elevn	UTM Grid
1.	S. Eur	Temska	550 m	FN 29
2.	S. Eur	Zavoj	650 m	FN 39
3.	Oak	Beside River Temscica	750 m	FN 29–FN 39
4.	S. Eur	Topli Do	750–800 m	FN 39–FP 30
5.	S. Eur	Beside River Toplodolska	800–1000 m	FP 30
6.	Oak	Kucnicko Krajiste	900–1000 m	FN 39
7.	Rocky	Beside River Rakitska	1350 m	FP 30
8.	Rocky	Beside River Ilijina	1400 m	FP 30
9.	Rocky	Babin Zub	1500 m	FP 30
10.	Rocky	Zarkova Cuka	1750 m	FP 30

Table 2. Results.

Species	Localities: 1	2	3	4	5	6	7	8	9	10
HESPERIIDAE										
Pyrgus malvae L.	.	.	.	.	*	.	*	*	.	*
Pyrgus alveus Hübn.	*	.	*	.	.	.	.	.	.	.
Pyrgus sidae Esp.	.	.	.	*	.	.	.	.	.	.
Spialia orbifer Hübn.	.	*	*	*	*	.	.	.	.	.
Carcharodus lavatherae Esp.	.	.	*	*	*	*	.	.	.	.
Carcharodus flocciferus Zell.	.	.	*	*	*	*	.	.	.	.
Erynnis tages L.	*	*	*	*	*	*	*	.	.	.
Thymelicus flavus Brunnich	.	.	.	.	*	.	.	.	.	.
Thymelicus acteon Rott.	*	*	.	*	.	.	.	.	.	.
Ochlodes venatus B. & G.	.	.	.	.	*	.	.	*	.	.
PAPILIONIDAE										
Iphiclides podalirius L.	.	.	.	.	*	.	*	*	.	.
Parnassius apollo L.	.	.	.	*	*	.	.	.	.	.
PIERIDAE										
Aporia crataegi L.	.	.	.	.	*	*	*	.	.	.
Pieris brassicae L.	.	.	.	*	*	.	.	.	.	.
Pieris napi L.	*	*	*	*	*	*	*	*	.	.
Pieris rapae L.	.	.	.	.	*	*	*	.	.	.
Pieris mannii Mayer	.	.	.	.	*	.	*	*	.	.
Anthocharis cardamines L.	.	.	*	*	*	.	.	.	.	.
Colias alfacariensis Berger	*	.	.	*	.	.	.	.	.	.
Colias crocea Geoff.	.	.	.	*	.	*	.	.	.	.
Gonepteryx rhamni L.	*	.	.	*	.	.	.	.	.	.
Leptidea sinapsis L.	*	.	.	*	.	*	*	.	.	.
LYCAENIDAE										
Lycaena phlaeas L.	.	.	*	.	.	*	*	.	.	.
Lycaena candens H. & S.	.	.	.	.	.	.	.	*	*	.
Heodes virgaureae L.	.	.	.	*	*	.	.	*	*	.
Heodes alciphron Rott.	.	.	.	*	*	.	*	.	.	.
Heodes tityrus Poda	.	.	.	*	.	.	.	.	.	.
Quercusia quercus L.	.	.	.	.	*	.	.	.	.	.
Nordmannia acaciae F.	.	.	.	*	*	*	.	.	.	.
Nordmannia pruni L.	.	.	.	*	*	.	.	.	.	.
Cupido minimus Fuessly	*	.	.	.	.	.	.	.	.	.
Cupido argiades Pallas	*	.	.	.	*	.	.	.	.	.
Celastrina argiolus L.	.	.	.	.	*	.	.	*	.	.
Scolitantides orion Pallas	.	.	.	.	*	.	.	.	.	.
Glaucopsyche alexis Poda	.	.	.	.	.	.	.	*	.	.
Maculinea arion L.	.	.	.	.	*	.	*	.	.	.
Maculinea alcon D. & S.	.	.	.	.	*	.	.	.	.	.
Plebejus argus L.	.	*	.	*	*	*	*	*	.	.
Plebejus idas L.	.	.	.	.	*	.	.	.	.	.
Plebejus sephirus Friv.	.	.	.	.	.	.	*	.	.	.
Aricia allous Geyer	.	*	.	*	*	*	.	*	.	.
Aricia eumedon Esp.	.	.	.	.	.	.	*	*	.	.
Aricia agestis D. & S.	.	.	.	*	.	.	.	.	.	.
Cyaniris semiargus Rott.	.	.	.	.	.	*	*	*	*	.
Polyommatus ripartii Frey.	*	.	.	.	.	.	.	.	.	.
Polyommatus admetus Esp.	*	.	.	.	.	.	.	.	.	.

Table 2 (*continued*). Results.

Species	Localities: 1	2	3	4	5	6	7	8	9	10
Polyommatus amandus Schneider	.	.	.	.	*	.	*	.	.	.
Meleageria daphnis D. & S.	.	.	.	*	*	.	.	.	.	.
Polyommatus icarus Rott.	*	*	.	*	.	*	.	.	.	.
Polyommatus thersites Cant.	.	.	.	.	*	.	.	.	.	.
Polyommatus eroides Friv.	.	.	.	.	.	.	.	.	*	.
SATYRIDAE										
Kanetesia circe F.	.	.	*	.	.	*	.	.	.	.
Hipparchia fagi Scop.	.	.	.	.	*	*	.	.	.	.
Hipparchia volgensis M.-P.	.	.	.	*	*	*	.	.	.	.
Erebia ligea L.	.	.	.	.	*	.	*	*	.	.
Erebia euryale Esp.	.	.	.	.	*	.	*	*	.	.
Erebia orientalis Elwes	.	.	.	.	.	.	.	*	*	*
Erebia aethiops Esp.	.	.	.	.	*	.	*	.	.	.
Erebia medusa D. & S.	.	.	.	.	*	.	.	.	.	*
Erebia alberganus phorcys Frey.	.	.	.	.	*	.	*	*	.	.
Erebia ottomana H.S.	.	.	.	.	.	.	*	.	.	.
Erebia oeme Hübn.	.	.	.	.	.	.	.	*	.	*
Melanargia galathea L.	*	*	*	*	*	*	*	*	.	.
Maniola jurtina L.	*	*	*	*	*	*	*	*	.	.
Hyponephele lycaon Kuhn	.	.	.	.	.	*	.	.	.	.
Aphantopus hyperantus L.	.	.	*	*	*	*	*	.	.	.
Coenonympha pamphilus L.	*	*	*	*	*	*	*	*	.	.
Coenonympha rhodopensis Elwes	.	.	.	.	.	.	.	.	.	*
Coenonympha leander Esp.	.	.	.	.	.	.	.	*	.	*
Coenonympha arcania L.	.	.	.	.	.	.	.	*	.	.
Coenonympha glycerion Bork.	.	.	.	.	*	*	*	*	.	.
Pararge aegeria L.	.	.	.	.	.	*	*	*	.	.
Lasiommata maera L.	.	.	.	.	.	.	.	*	.	.
NYMPHALIDAE										
Araschnia levana L.	.	.	.	*	*	*	.	.	.	.
Inachis io L.	.	.	.	.	*	.	*	.	.	.
Vanessa atalanta L.	.	.	.	.	*	.	.	*	.	.
Vanessa cardui L.	.	.	.	.	*	.	.	*	.	.
Aglais urticae L.	.	.	.	.	*	.	.	*	.	.
Nymphalis polychloros L.	.	.	.	*	.	.	.	.	.	.
Polygonia c-album L.	.	.	.	*	*	*	*	.	.	.
Argynnis paphia L.	.	.	.	.	*	.	*	*	.	.
Argynnis aglaja L.	.	.	.	.	*	.	*	*	.	.
Argynnis niobe L.	.	.	.	.	*	*	*	.	.	.
Argynnis adippe D. & S.	.	.	*	.	*	*	.	.	.	.
Issoria lathonia L.	.	.	.	.	*	.	*	.	.	*
Brenthis hecate D. & S.	.	.	.	.	*	.	.	.	.	.
Brenthis daphne D. & S.	.	.	.	.	*	.	.	*	.	.
Melitaea didyma Esp.	.	.	.	.	*	*	.	.	.	.
Melitaea cinxia L.	.	.	.	.	*	.	.	.	.	.
Melitaea athalia Rott.	.	.	.	.	*	.	*	.	.	.
Apatura ilia D. & S.	.	.	.	*	*	.	.	.	.	.
Apatura iris L.	.	.	.	*	*	.	.	.	.	.
Limenitis reducta Staud.	.	.	.	.	.	.	*	.	.	.
Neptis rivularis Scop.	.	.	*	*	*	.	.	.	.	.

Results and observations

A number of specifically central European species were found. In relation to the fauna of the Carpathian, Dinaric and Sar-Pindus mountain systems, they are expressly isolated, and their closest connections are with the ancient Bulgarian Rhodopi massif. Species: *Aricia eumedon* Esp., *Hipparchia volgensis* M.P., *Erebia orientalis orientalis* Elwes, *Erebia alberganus phorcys* Frey., *Coenonympha leander* Esp.

The full results are shown in Table 2 and they make a worthwhile contribution to the established faunistic knowledge of this part of Serbia. Many of them are new records for these particular UTM squares.

A number of species are at the edge of their recorded range. *Plebejus sephirus* Frivaldsky is at the northern limit of its range in Yugoslavia. *Aricia eumedon* Esp. is at the most easterly edge of its range in Yugoslavia. *Polyommatus ripartii* Frey. is at the northeastern limit of its range in Yugoslavia. *Hipparchia volgensis* M.P. is at the northern limit of its range in Yugoslavia. *Coenonympha rhodopensis* Elwes is at the northwest limit of its known range.

Two new records for Yugoslavia have been published separately (Jaksic, 1995)—*Erebia alberganus phorcys* Frey. and *Erebia orientalis* Elwes.

Maniola jurtina

Particular attention was paid to the population structure of *Maniola jurtina* L. Early work by Thomson and others focused on the male genitalia and the number of

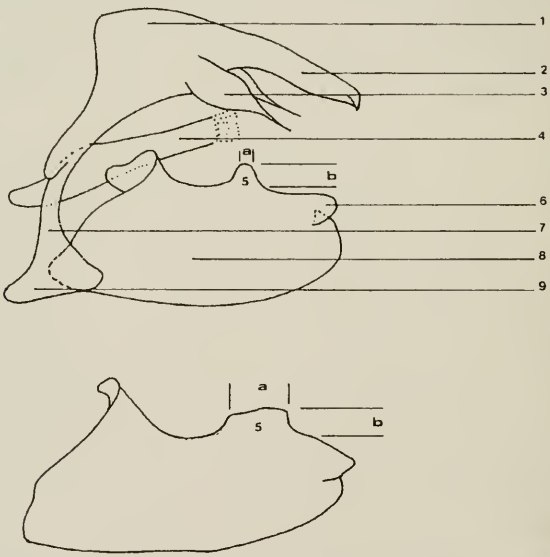

Figure 1. Diagrammatic representation of the two main *jurtina* valve types, showing terms used by Thomson (1987) and measurement parameters. Maniolini male genitalia (*Maniola jurtina* 'western' above, 'eastern' below). Anatomy and taxonomy of the armature and measurement parameters used: 1 tegumen, 2 uncus, 3 gnathos, 4 aedeagus, 5 dorsal process, 6 distal process, 7 vinculum, 8 valve, 9 saccus, a = dorsal process width, b = dorsal process length.

ocelli on the hind wings of the males. Thomson (1973) identified two distinct types of valve in the male genitalia, which he called the eastern and western types. These are illustrated in Fig. 1 for reference, although intermediate or transitional forms also occur. Thomson went on to correlate valve type with geographic distribution, and his map (Fig. 2 Thomson, 1987) shows that Stara Planina lies in an area where the eastern valve type is to be expected.

The valve types found at Topli Do are illustrated at Fig. 3 with examples from the wider area of the Balkans shown at Fig. 4. It comes as no surprise to note that they are of the eastern type, nonetheless, they are published to assist future research.

Brakefield's extensive work (1984) on hindwing eyespot development is summarized in Kudrna (1990) and Fig. 5 shows the standard notation used in this connection.

In the sample of 90 males collected in the vicinity of Topli Do, 72 (80%) have two spots in the splay configuration (S2 type). This correlates well with a sample of 124 males collected in the vicinity of Pristina, Jaksic's home town, amongst which 74 (60%) were found to be of the S2 type. There was no correlation between the valve type and the eyespot pattern in either population. It was judged that the two populations are morphologically indistinguishable.

Conclusion

The ancient relict area of Stara Planina holds an impressive diversity of flora and fauna. On this expedition we took a total of 94 species, including no less

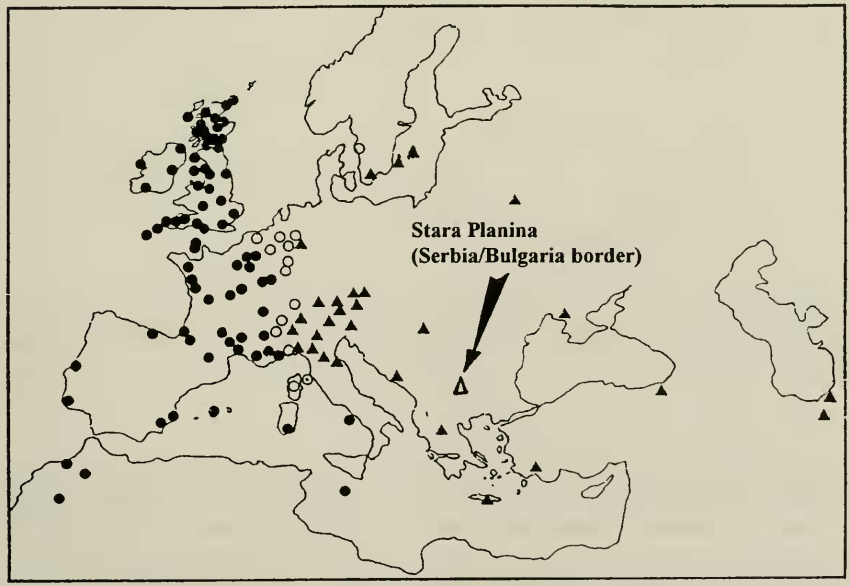

Figure 2. The distribution of valve types in *Maniola jurtina*, showing distribution of 'eastern' (▲), 'western' (●) and 'transitional' (○) male genitalia forms.

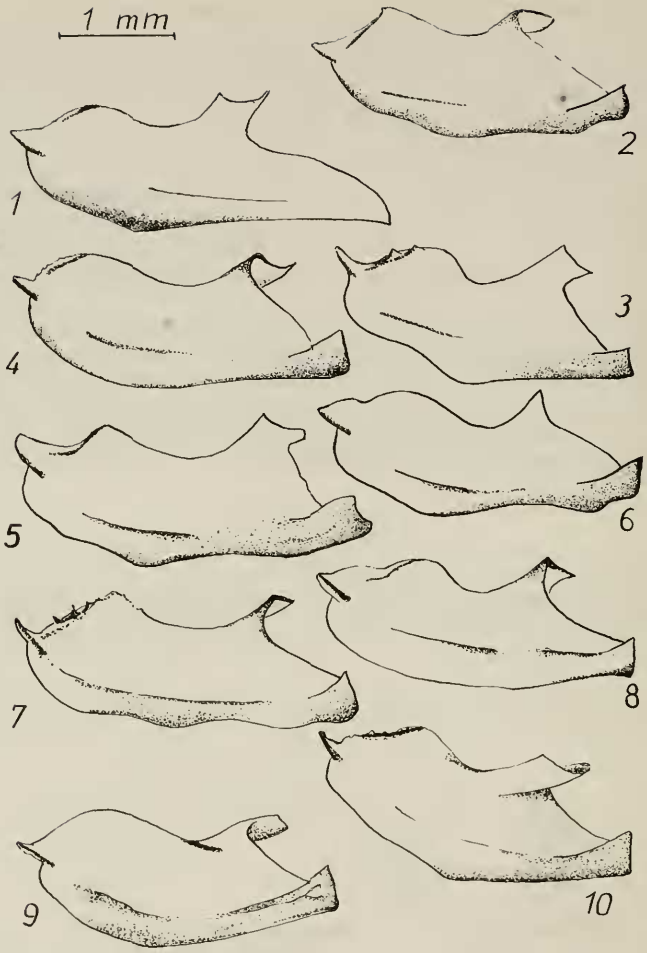

Fig. 3. Male genitalia (valva) of *Maniola jurtina* L. Serbia, Stara Planina: Topli Do, 800 m, 11–14.vii.92, all Jaksic leg. 1 prep. no. 1855. 2 prep. no. 1856. 3 prep. no. 1857. 4 prep. no. 1858. 5 prep. no. 1860. 6 prep. no 1859. 7 prep. no. 1862. 8 prep. no. 1861. 9 prep. no. 1864. 10 prep. no 1863.

than 72 at and above Topli Do (localities 4 and 5 in Table 1). These records include some species isolated from adjacent mountain systems, and a number of more widespread species which are at the edge of their range, as well as two that are new for Yugoslavia. The study of *Maniola jurtina* L. (spotting and genitalia) accords well with Thomson (1975, 1987) and suggests that the population on Stara Planina is no different to that from the vicinity of Pristina.

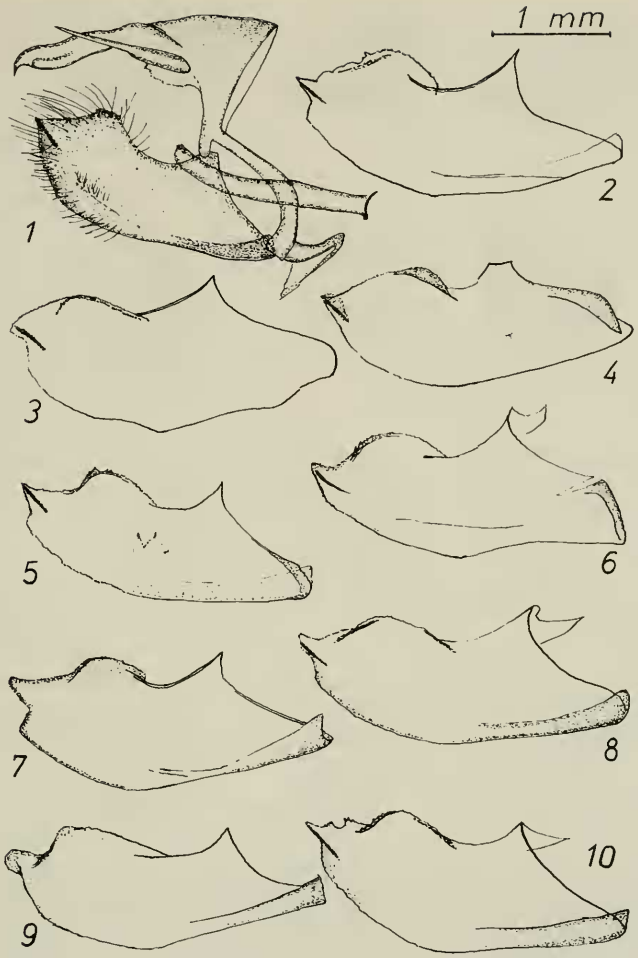

Fig. 4. Male genitalia (valva) of *Maniola jurtina* L. 1 Montenegro, Durmitor: Dobrilovina, 800 m, 23.vii.91, prep. no. 1791, Jaksic leg. 2 Slovenia, Nanos, 1000 m, 13.viii.87, prep. no. 1797, Sukic M. leg. 3 Vojvodina, Sonta, 80 m, 11.vi.84, prep. no. 1789, Siladjev S. leg. 4 Serbia Kopaonik: Baciste, 1600 m, 3.viii.86, prep. no. 1369, Jaksic leg. 5 Montenegro, Durmitor: Tara-Vrelo, 600 m, 30.vii.84, prep. no. 1792, Jaksic leg. 6 Montenegro, Durmitor: Tara-Vrelo, 600 m, 30.vii.84, prep. no. 1368, Jaksic leg. 7 Serbia, Stara Planina: Kaludjerske bare, 1000 m, 9.vii.85, prep. no. 1787, Jaksic leg. 8 Serbia, Pristina: Grmija, 700 m, 4.vii.74, prep. no. 3066, Jaksic leg. 9 Macedonia, Pletvar, 900 m, 20.vii.83, prep. no 1793, Jaksic leg. 10 Greece, Olimp: Litochoron, 100 m, 19.vi.84, prep. no. 1796, Jaksic leg.

Aside from the scientific observations, memories of Topli Do include Apollos floating around open glades, eight silver-washed fritillaries sunning themselves on the side of a barn, hundreds of Idas blues assembled drinking at moist patches on the path and orange-tips flying inexplicably late in the season.

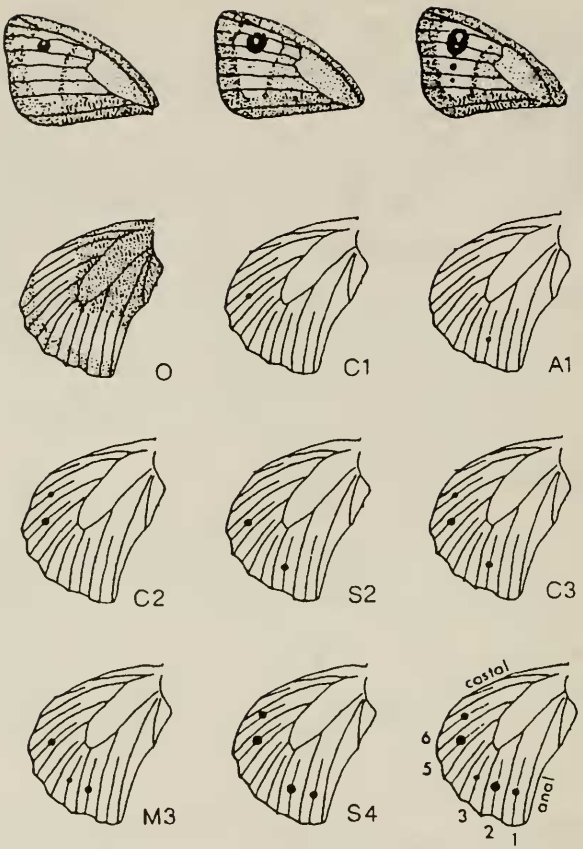

Fig. 5. *Maniola jurtina* hindwing eyespot development (after Kudrna 1990, with minor alterations). Diagram of variation in the spot pattern on the ventral surface of the wings of *Maniola jurtina*. **Top row**: variation in the forewing eyespot (unshaded area is of brighter fulvous coloration); left: small black eyespot with single white pupil (characteristic of males); middle: larger spot with single pupil (characteristic of females); right: a more extreme female phenotype showing a very large eyespot with two pupils (f. *bioculata*) and with two additional spots (f. *addenda*). **Bottom three rows**: illustrate nine of the thirteen commonly occurring hindwing spot phenotypes: **0** nought spot, **C1** costal 1, **A1** anal 1, **C2** costal 2, **S2** splay 2, **C3** costal 3, **M3** median 3, **S4** splay 4 and all 5 spots (not shown: A2, A3, C4 and A4). The nought spot specimen illustrates the position of the lighter band within which the spots lie. The reference numbers of the spots are indicated. Different sized hindwing spots present an idea of changes in relative (not absolute) spot size.

Acknowledgements

The authors are indebted to George Thomson for his assistance in putting the findings on *Maniola jurtina* into context and particularly for his authority to reproduce Figs 1 & 2 from his PhD thesis (Thomson, 1987). Otakar Kudrna's consent to reproduce Fig. 5 (after Kudrna, 1990, with minor alterations) is similarly appreciated.

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SHORT COMMUNICATION

Some observations on *Agrilus sinuatus* (Ol.) and *A. pannonicus* (Pill. & Mitt.) in south-east London.—Previously both regarded as extremely rare insects and accorded Red Data Book status 2 "vulnerable" by Levey (1987), these jewel beetles have more recently been shown to be quite widespread. Exit holes and larval workings allow fairly confident diagnosis of the species, and although their presence does not necessarily mean that there is a thriving colony, it is usually fairly obvious how old these signs are. Both species have now been "down-graded" to Notable A status (Hyman & Parsons, 1992).

Both of these species have been found widely in north London (Foster, 1987; Hackett, 1994), so I was pleased to find them recently in south-east London. On 6.vi.95, I found *A. sinuatus* borings under the bark of a dead hawthorn on the eastern edge of Beckenham Place Park, between Lewisham and Bromley (TQ 378710; VC 16, West Kent). And on 19.vi.95 I discovered exit holes in another dead hawthorn near the western boundary of the park (TQ386706). On 4.ix.95 and 10.x.95, I found exit holes in several old hawthorn trees just outside the entrance to St Augustine's Church, Honor Oak (TQ358745; also VC16, West Kent).

On the occasion of 4.xi.95, I also found extensive exit holes of *A. pannonicus* in the stump of a large tree, probably oak, in the grounds of St Augustine's Church. This stump also produced *Platypus cylindrus* (F.) (Platypodidae), *Bitoma crenata* (F.) (Colydiidae) and a large dead female stag beetle *Lucanus cervus* (L.) (Lucanidae).

The twisted tunnels of *A. sinuatus* have previously been illustrated (Alexander, 1990), but those that I found in Beckenham Place Park showed a more regular sinuous character (Fig. 1a), which I took to be the initial borings of earlier larval instars. The characteristic D-shaped exit holes of the two species are slightly different in shape; those of *A. sinuatus* are broader and flatter and more nearly semi-circular (Fig. 1b), while those of *A. pannonicus* are generally rounder and more highly arched (Fig. 2a). It is probably as a consequence of the relative sizes of the respective tree species which are burrowed, that whereas exit holes of *A. sinuatus* occur sparingly in